THE 1995 PRESIDENTIAL ADDRESS—PART 1 REPORT

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The British are well known both for their enthusiasm for natural history and their love of societies. It has been my great privilege for the last year to have been President of this long-established organization—one occupying a special niche in British natural history. Founded in 1872, as the South London Entomological and Natural History Society, the British Entomological and Natural History Society seems to be thriving by combining its great strength—an emphasis on practical entomology, field studies in particular—with a growing determination to use its collective knowledge in matters relating to invertebrate conservation. I shall have more to say about this latter issue in a moment.

I am a relative newcomer to Council, although I have been a member of the Society for 22 years. But from sitting around the Council table over the last two years, I have been struck greatly by the enormous level of experience that exists and that is put towards running the BENHS. The purpose of our Society is stated in the bye-laws to be the 'promotion and advancement of research in biology, especially entomology, and its diffusion. . . '. But to achieve that purpose involves organization: holding Council meetings; taking minutes; arranging and leading field meetings, lecture meetings, workshops and open days; curating the collections; managing the finances; dealing with the membership; handling sales of various goods produced by the Society; editing the journal; distributing the journal and other information about the Society; arranging the annual exhibition and dinner; and managing the Society's headquarters—the Pelham-Clinton Building at Dinton Pastures. It is the officers and ordinary members of Council on whom these tasks fall chiefly. You have just heard about some of their activities over the past 12 months from the reports. Previous Presidents have noted that while the incumbent of the office is required to chair meetings and act as a facilitator, most of the hard labour is shouldered by the officers and ordinary members of Council. I agree with that observation. So I am delighted to take this opportunity to thank formally all these people—they have made my presidential year interesting, and provided great support based on their extensive, collective experience.

Let me mention three of them. Our Sales Secretary, Roger Hawkins, retired from the position at the end of last year, as did the Assistant Treasurer, Mark Telfer, from his post. May I thank them, on behalf of Council and the membership, for their service to the Society in these important jobs. A long-standing member retiring from Council this year is John Muggleton. I make special mention of him, not just for his many years service to the Society, but also because of his invaluable ability to interpret proposals that arise in Council in the light of the bye-laws. I feel sure that the Society will benefit from his advice again in a formal capacity soon.

During the course of the year it has been my sorry duty to announce the deaths of 11 members, several who had been prominent in the Society.

Mr Stanley Maurice Hanson, from West Sussex, died on 18 March 1995. He had been a member of the Society since 1949 and was interested in Lepidoptera.

Dr Patrick J. L. Roche died in March 1995. He was a special life member having joined the Society in 1942. His special interest was in Hemiptera, in particular Pentatomidae. Patrick Roche was a medical doctor and pathologist whose career took him to Pentonville Prison, West Africa, Sabah, and the Seychelles. He retired to

Andorra where he was involved in preparing a list of Andorran insects. He made a representative collection of Andorran insects and a trust for the study of Andorran natural history was formed at his behest. He was a knight of St Sebastian.

Mr Horace Last died on 4 April aged 87. He was elected a special life member of the Society in 1991 having joined in 1941. By profession, he was a tea taster. His entomological interest was in the Coleoptera, particularly Staphylinidae. Horace Last published papers on British and Channel Island Staphylinidae, and also on tropical myrmecophilous staphylinids, particularly those of Africa.

Mr S. Maurice Jackson died in late May 1995. He had been a member since 1989 and was Yorkshire Macrolepidoptera Recorder for many years.

Mr Bruce Burns, who died on 1 June 1995, joined the Society in 1944, but was no longer a member at the time of his death. His main interest was in the Macrolepidoptera, particularly of Hampshire. Before his work took him to the North, he regularly exhibited specimens at the Annual Exhibition of the Society.

Mr Hugh N. Michaelis died on 29 July 1995. He joined the Society in 1951 and was interested in Lepidoptera, particularly Microlepidoptera, and also sawflies. Much of his work was carried out in Lancashire; he was a prominent member of the Lancashire and Cheshire Entomological Society. In later years he worked extensively on Microlepidoptera of north Wales and did much to encourage many collectors.

Mrs Frances Mary Murphy died on 20 July 1995. She joined the Society in 1962 and became an active member. She served as Secretary during the 1980s and became President in 1989—the first and, so far, only woman to occupy the position. She specialized in spiders and was known for her work on the group internationally. She travelled widely, collected specimens from many countries, and was a capable and enthusiastic photographer of these animals. Several of her many publications were printed in the Society's journal.

Mr Eric Bradford died, in a road accident, on 12 August 1995. He had been a member since 1960 and, in recognition of his work for the Society, was elected an honorary member in 1985. He served the Society in many ways behind the scenes, frequently using his professional graphics skills to produce signs and displays. That he was a talented illustrator is well known to all those familiar with his paintings of Microlepidoptera published in our journal. He was the Society's curator for 10 years. Although his special interests were in Microlepidoptera, he was involved in natural history broadly, even to the extent of buying two pieces of land on which he created nature reserves. His collections have been bequeathed to the Society.

Mr Howard G. Phelps died in the summer of 1995 while on holiday in Spain. He lived in Wiltshire and joined the Society in 1976 although he was no longer a member at the time of his death. He was respected as a good all round naturalist and had developed a special interest in Spanish butterflies, of which he had a collection.

Mr Humphrey W. Mackworth-Praed died on 13 September 1995. He had been a member since 1960 and had a special interest in Lepidoptera—particularly European butterflies—and was a general natural historian of note. His autobiography, entitled *Conservation pieces*, was published in 1991. He was an active member of the National Trust and the Surrey Wildlife Trust. His considerable collection, chiefly of butterflies and natural history books, was bequeathed to the Society.

Mr Leonard Francis Ferguson died on 19 November 1995. He had been a member since 1936 and would have become an Honorary Life Member this year. He was born in 1910 and developed an interest in natural history in childhood. He qualified as a dental surgeon, served in the Royal Dental Corps during the war and, subsequently, practised in Teddington, Middlesex. During his active retirement in Devon he was a keen observer of wildlife and an enthusiastic gardener.

We have stood already in memory of these members at previous meetings.

Over recent years, Council has been considering the future of the BENHS. This year there has been further discussion on developing the activities of the Society. In 1994, a paper was put before Council expressing some concern that the BENHS might to some extent lose its role and value if members were increasingly to see their interests being served principally by specialist groups outside the Society. The writers of this paper had in mind, particularly, special interest groups involving Diptera, Hymenoptera and Coleoptera.

By the spring of 1994, Council had agreed unanimously the affiliation with the BENHS of the Dipterists' Forum, a group founded in 1994. The mechanics of this process enabled the affiliation to take place in 1995. Discussions over affiliation of the Bees, Wasps and Ants Recording Scheme (BWARS) are still in progress. The idea of the BENHS acting as an umbrella organization to which such organizations are affiliated is surely a good one, although not without organizational implications.

Further development has occurred on the Society's role in invertebrate conservation. The idea of the BENHS having a greater impact in this field was suggested in 1993, and proposals were put in place later that year and in 1994. The aim of the initiative was to promote invertebrate conservation and to encourage members of the Society to apply their expertise to this end. Among the seven objectives of the proposal was one on promoting 'the validity of invertebrate collecting as a legitimate means of gaining knowledge for science and conservation'.

Members of the Society will be aware of a growing hostility towards collecting in certain quarters, much of it poorly considered. The BENHS is a Society that supports responsible collecting, and disassociates itself from irresponsible collecting. Plainly, what constitutes responsible and irresponsible collecting is a matter of judgement. But that the Society is open to discussion of collecting issues can be seen from the publication of recent articles on the subject in its journal (Miles, 1995; Stubbs, 1995). The matter was also considered in the 1988 Presidential Address (McLean, 1990). Debate about collecting insects is essential if prejudices and entrenched positions about the subject are to be avoided. What unquestionably is true, is that a great swathe of knowledge about natural history has resulted from collecting and the study of collections. Also, it is the case that collections have an enormous role yet to play in the study of natural history. The amount of revisionary taxonomy still needed on invertebrates, an undertaking based substantially on collections, is immense. And good revisions form, in my view, a critical basis for conservation biology, rich, as the good ones are, in compilation and interpretation. I can vouch for the value of collections with some confidence after spending my entire research career to date working in three different natural history museums almost entirely on preserved material. Moreover, significant parts of these collections were built up by people who collected for a hobby; those who argue that collecting can be justified only for specific scientific or conservation purposes should consider this point carefully.

As with nearly all issues in a complex social setting, the answer lies in compromise and will be achieved best by careful thought. What increasingly is of concern is the effect of inadequately drafted legislation intended for environmental or species protection that threatens to restrict or ban collecting. Paradoxically, such an action may have the effect of restricting research of environmental value if sampling of organisms is required to achieve results.

The BENHS, as an important society for fieldwork in Britain, has much that it can do to help encourage a balanced approach to collecting, particularly in the context of the complex relationship that exists between collecting and conservation. Although a natural history society exists primarily, and rightly, for the benefit of its members, the activities of our Society are likely to be scrutinized when activities have an effect within the public domain. The pressures on collecting are almost certain to increase and this Society, and other societies or institutions, can expect to have to deal increasingly with objections on moral and legal grounds. If some kind of co-ordinated effort is not made fairly soon by societies like the BENHS to address this issue, insect collecting may start to become viewed with the same general distaste as exists for birds' eggs collecting. The impact of amendments to the Lacey Act in the United States on collecting has been considerable. Collecting insects in certain countries of the European Union is becoming increasingly difficult. How long will it be before European Community legislation incorporates measures similar to those in the USA?

Although fieldwork by the BENHS is essentially British, I am delighted here to mention the recent expedition involving three members of the Society to Belize. Context in natural history studies adds a further dimension to interpretation, so it is surely a healthy sign for the Society to look beyond British shores. Paul Waring, who led the expedition, and his colleagues, should be congratulated for their initiative. With the threat to biodiversity in the tropics, collecting expertise can be put to use in such areas contributing to the pool of specimens on which taxonomic research can be undertaken. Besides this particular expedition by the Society, members have ever more connection with their Continental European colleagues. I sincerely hope that these associations will increase; it can only benefit entomology if we work together and so increase our effectiveness in the field of natural history.

Finally in this report, let me turn to the way in which I see the more general role of the BENHS. At times in which we are all exhorted to have mission statements, roles, aims and objectives, perhaps the first purpose of the BENHS is simply to have fun—to enjoy natural history. Enjoyment and enthusiasm for something are qualities prerequisite for real achievement.

That being said, perhaps the most important broader role of the BENHS is to contribute to knowledge of the natural history of invertebrates, particularly insects, of Britain in a Continental European context. By way of field meetings, indoor meetings and workshops in particular, experience is passed between members of different ages and different interests. This Society has a special role to play in acting as a conduit for the common stream of knowledge of insect natural history in Britain. This may not sound very dynamic; yet the effect of such a flow of information is enormous.

But while a sense of continuity is the background against which the lives and work of most of us are lived, evolution is also a part of any society. So in the late 20th century, what should be the orientation of the BENHS? I have no definite answers, but put forward three main areas on which members of the Society may care to reflect. Whatever the answers are, I think that at a time of considerable change, institutions that thrive are likely to be those with a keen sense of identity.

The first lies in the role of the Society in the field of invertebrate biodiversity. The word biodiversity is one that has become very much a part of the language of environmental politics. Members of the BENHS may feel, reasonably enough, that the study of biodiversity is precisely that in which the Society has been engaged since its very foundation. But although it is sometimes tempting to shrink from concepts that have become fashionable, the threat to biodiversity is also a threat to the purpose of any society involved in its study. Therefore, it can be no bad thing if we can have a role in its preservation.

What kind of role might the BENHS play in this area? Some societies are mainly pressure groups; some adopt a more fact-based, advisory role; others lie somewhere between. The BENHS is quintessentially a factual/knowledge-based society, so the advisory end of the spectrum is, in my view, where it is likely to be most effective.

The second point is related to the one I made earlier about helping to maintain the common stream of natural history knowledge. It is important that we should be fully aware of this role, which, broadly speaking, is educational, and build on it. Field meetings, workshops, open days, indoor meetings and publications are the main practical ways in which this important role is fulfilled. The programme of activities over the last year is something of which the Society can be justly proud.

The third and final point concerns the relationship between the Society and other organizations, and the relationship between amateurs and professionals. The fact that so many members of the BENHS belong to other natural history or biological societies demonstrates that extensive contacts do exist. The seamless professional/amateur interaction that occurs within our Society is a great strength, for the knowledge of amateurs and professionals within the BENHS is of a highly complementary nature. Given the evident need for keys and guides to the British invertebrate fauna, there is much more that could be done if efforts were to be combined to specific ends. The Department of Entomology at The Natural History Museum is in the process of expanding its role in work on the British insect fauna, particularly in the fields of taxonomy, nomenclature and putting taxa in a broader geographical perspective—particularly Palaearctic. There are great opportunities for collaborative work between members of the BENHS and the Museum relating to this initiative.

The Society will gain a further opportunity in its broadly educational role through interested members becoming increasingly involved in collaboration to produce yet more publications on the British invertebrate fauna.

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THE 1995 PRESIDENTIAL ADDRESS—PART 2 NATURAL HISTORY: SOCIETIES AND MUSEUMS

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In Part 2 of this address I intend to expand on the relationship between natural history societies (especially the British Entomological and Natural History Society) and natural history museums, using illustrations from work on the Lepidoptera.

In my President's Report, emphasis was placed on the relevance of the Society's traditional type of knowledge and skills to natural history studies in the modern world. The setting is ideal for these words given that the society I address (the BENHS), the society in the rooms of which this meeting is being held (the Royal Entomological Society), and the Natural History Museum, from which I have just come, were all established through Victorian energy and vision and are bound by the concept of natural history.

Yet, despite their similarities, each of these organizations has a different character. Go to their meetings, and while one will find overlap among them, one will also experience somewhat different flavours. This observation underlines the point that natural history is many sided—a pluralistic concept finding its way, to a greater or lesser extent, into many organizations. There are natural history museums, national natural history societies (here and abroad), local natural history societies, and even government departments with some element of natural history as part of their brief (for example, the Department of the Environment and its Darwin Initiative).

This pluralism makes natural history difficult to define. Perhaps the enduring characteristic of the very best natural history is that it involves using detail and information from particular disciplines to tell bigger stories. Probably, natural history is better described by examining the temperaments or types of people associated with the subject. I have identified three or four key types or temperaments involved in natural history. These categories are by no means mutually exclusive: they may be visualized as a series of overlapping sets (Fig. 1), for there exist many examples of people who fall into more than one of these categories. There are various ways of arranging the circles in the figure.

The first category is the naturalist—exemplified by Charles Darwin and Alfred Russell Wallace. Naturalists exhibit the capacity to make a wide variety of detailed observations. Admittedly, some, notably Darwin and Wallace, have had the ability to make quite exceptional connections between their observations and to perceive process behind pattern with an impact probably never equalled by other naturalists—at least in terms of social and scientific effects. But this spirit of observation and recording is typical of members of natural history societies now and in the past.

The second type is the natural philosopher/synthesizer—the scientist interested in broad phylogenetic patterns, groundplans and the like. Typically, such individuals observe more at the museum or laboratory bench by dissecting specimens from the collections and looking down the microscope than from tramping the field. A classic British example of the synthesizer is T. H. Huxley. (There have been more from continental Europe—Ernst Haekel and Karl Ernst von Baer, for example.) While natural historians are often naturalists *and* synthesizers, there is a tendency for individuals to exhibit the temperament of one more than the other. The examples I have chosen to illustrate the naturalist and the synthesizer throw the categories into

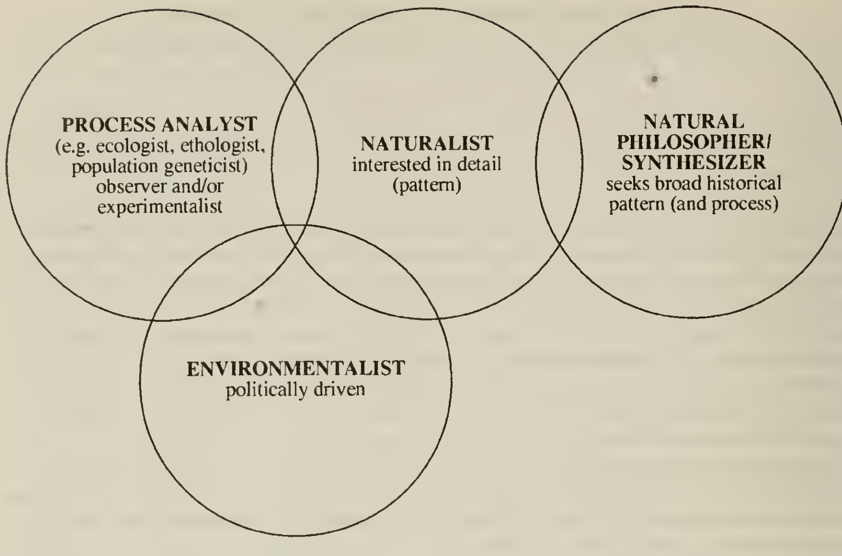


Fig. 1. A concept of natural history defined by different kinds of contributors to the subject.

sharp perspective. The differences in approach between Darwin and Huxley are brilliantly portrayed in two recent biographies of the two men (Desmond & Moore, 1991; Desmond, 1994). But Huxley's own words, written in 1889 for his autobiography, sum up the position of the synthesizer perfectly:

> . . .I am afraid there is very little of the genuine naturalist in me . . . species work was always a burden to me; what I cared for was the architecture and engineering part of the business, the working out of the wonderful unity of plan in the thousands and thousands of diverse living constructions, and the modifications of similar apparatuses to serve diverse ends. (Huxley *in* de Beer, 1983)

While museum systematists are, of course, very often concerned with species work, it is in museums that the natural history synthesizers tend to be found. They occur also in research institutes and universities, but there are many fewer involved with species taxonomy or higher classification in the universities now than in the past (at least in Britain).

My third type of natural historian, the process analyst, who is involved more with studying natural process than pattern, is usually found in a university or applied research institute. The discipline involved primarily is ecology, but behaviour and population genetics fall into this grouping. Ecologists have a profound influence in the way we view processes in the natural world. Like many other fields of research there is considerable subdivision within the subject and much overlap with other subdisciplines of biology.

Experimental approaches to ecology, and mathematical modelling of interactions between natural processes, are in the ascendant today. Rather less evident, although still very important, is field-based, observational ecology. Within natural history, experimentalists have had considerable impact in the fields of population genetics, embryology and speciation mechanisms. Molecular techniques are becoming increasingly important in all these fields. Experimentation facilitates manipulation of the environment so that the role of particular natural processes can be understood better.

I am doubtful that environmentalists should be included in natural history as a fourth type. They are often more part of politics, so perhaps it is best to say that the results of work in the arena of natural history should find their way into environmentalism rather than the other way around.

This scheme is a broad one; but the method of perceiving the subject of natural history in such a way seems preferable to my attempting a strict definition. Natural history attracts such a variety of temperaments and working styles—naturalists, scholars, scientists of various disciplines, archaeologists, historians interested in man and the natural world, and, these days, economists (who are trying to value the environment) and lawyers (who write and interpret legislation as it affects nature).

The purpose of this preamble is to make the point that societies such as the BENHS are likely to flourish by being conscious of their identity but, at the same time, sensitive to the complex situation in which they exist in the general biological arena of today.

For the entomological substance of this address I will illustrate the sort of work that has been carried out typically in natural history museums—mainly because it lends itself to facilities uniquely available in these institutions: namely collections of specimens, libraries (collections of literature), and facilities for studying anatomy. I hasten to add that this is not the only research undertaken at museums; much else is done. But it is the kind of work that provides a platform for discussing the second of the types of natural historian—the synthesizer.

Professional taxonomists spend some of their research time investigating the systematic relationships of particular taxa. These days, for taxonomic papers to be acceptable to most journals, providing taxonomic context is very important—and rightly so. Over several years, I have worked on certain species of Lepidoptera, or groups of species, that affect our understanding of phylogenetic relationships within particular areas of the lepidopteran phylogenetic tree. The species in question are not British; but because so many families of this order of insects are distributed globally, or across more than one zoogeographical region, the implications for our understanding of the groups in question apply to higher taxa found in Britain.

The general point I hope to illustrate is that the study of a relatively few species can alter our perceptions about areas of higher classification. The preliminary stage of such a research process is actually finding the species that provide this kind of added value.

The Lepidoptera fall into a number of broad groupings—not necessarily monophyletic. These are: primitive Lepidoptera; lower Ditrysia; and higher Ditrysia (mainly macrolepidopterans).

The most striking anatomical variation in adult Lepidoptera occurs within just 1% of all species (e.g. Kristensen, 1984). For example, within the primitive Lepidoptera there occurs a change from moths with chewing mandibles to those with a sucking proboscis formed from the galeae of the maxillae. The earliest proboscis is moved by extrinsic muscles and lacks intrinsic musculature—that is, musculature within the lumen of the proboscis. But even among this primitive 1% of the order, intrinsic musculature, which occurs throughout the rest of the order, has developed. The larvae of Micropterigidae, arguably the most primitive family of Lepidoptera, are free-living and the cuticle is highly modified. They differ markedly from the larvae of the next most primitive family, Heterobathmiidae, from tropical South America, which are leaf-miners and lack the modified cuticle.

Nepticulidae: pygmy moths

Among the primitive Lepidoptera belongs a family of very small moths (with a wing-span sometimes under 6 mm) belonging to the family Nepticulidae—pygmy moths. The larvae of most species are leaf-miners; some tunnel in thin bark, others in the petioles and midribs of leaves, and a few in the seed capsule or wings of winged seeds of *Acer*. Nepticulids are predominantly temperate, but many subtropical and tropical species exist. There are about 600 described species and many still to be described. For example, only a few of the many Australian species already collected have been named.

Some years ago, I worked on the Nepticulidae in South Africa. Given the widespread distribution of the family, it was necessary to examine examples from as wide a geographical range as possible (globally in this case) to examine critically the higher classification of the family (that is, from the genus upwards). Material was borrowed, virtually all of it unstudied, from the Australian National Insect Collection in Canberra.

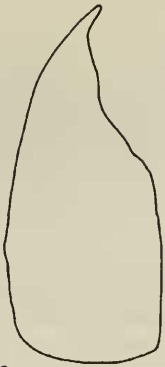
The male genitalia of all Nepticulidae examined to that time had a valva of the kind illustrated in Fig. 2. Although there is some variation in shape, most nepticulid valvae are approximately triangular. Modifications exist in some species, but this shape is widespread. By contrast, in Opostegidae (see Davis, 1989), the family considered to be the closest relatives of Nepticulidae, a more strongly modified valva occurs (e.g. as in Fig. 5). In particular, opostegids have on the valva a series of peg-like sensilla termed a 'pectinifer'. The opostegid pectinifer occurs on a stalk. Among the Australian nepticulid material were many species with peg-like sensilla on their valvae (Scoble, 1982), as in Figs 3 and 4. Although not borne on a stalk, these sensilla occur in the usual comb-like arrangement. In species with a rounded apex to the valva (e.g. Fig. 3), they are positioned around the apex.

Pectinifers are found in other monotrysian Lepidoptera. Indeed, Janse coined the term pectinifer for the comb-teeth in certain Incurvarioidea and restricted its use to the situation where it was borne on a stalk. The structure of these sensilla is similar under the light microscope. The presence of comb-teeth in Opostegidae and Incurvarioidea led Kristensen and Nielsen (1980) to suggest that, although there was evidence that Nepticulidae and Opostegidae were sister-groups (closest relatives to each other) because of the presence of 'eye-caps' (expanded antennal scapes), that observation should be weighed against the possible sister-group relationship between Opostegidae and Incurvarioidea as a result of their sharing the presence of pectinifers.

The discovery of these unusual pectinifers in Nepticulidae removes the argument for treating Opostegidae as the closest relatives of Incurvarioidea. Indeed, given the similarities between the two families, one wonders if there is anything useful to be served by treating Nepticulidae and Opostegidae as separate families rather than as subfamilies Nepticulinae and Oposteginae of the family Nepticulidae.

Bucculatrix (Leucoedemia) ingens

My second example (Scoble & Scholtz, 1984) falls within the lower Ditrysia. (The Ditrysia are those Lepidoptera in which the female has two reproductive pores—one for egg laying and the other for mating. They contrast with those monotrysian species, relatively few in number, in which there is a single pore. This division is a fundamental one in lepidopteran classification and was adopted by Börner in 1925.)



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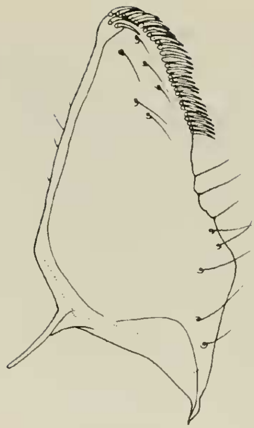

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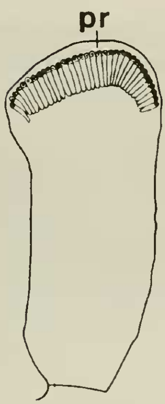

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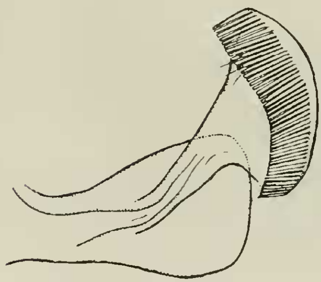

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Figs 2–5. Valvae of male genitalia of Nepticuloidea. 2, *Stigmella* (Nepticulidae); 3,4, *Pectinivalva* (Nepticulidae); 5, *Notiopostega* (Opostegidae) (after Davis, 1989). pr, pectinifer.

The genera *Bucculatrix* and *Leucoptera* will be known to all British lepidopterists, especially those interested in leaf-miners. Until fairly recently, both genera were placed in the Lyonetiidae but in separate subfamilies—Bucculatricinae and Cemiostominae respectively. Externally, the wing colour and pattern of these small moths look very different.

From galls on the stems of *Ozoroa paniculosa* (Anacardiaceae) from South Africa emerged a series of moths that looked like a large species of *Leucoptera* (Plate V, Fig. 1). The wings are glossy white with darker markings near and at their tips. Moreover, the scape of the antenna is expanded into an 'eye-cap', and the scales are appressed to the head (smooth-scaled condition). Certainly the moth hardly resembles typical *Bucculatrix* species with their rather drab wings.

The habit of living in galls is not typical either of *Bucculatrix* or of *Leucoptera* species. What was peculiar was the appearance of the cocoon, which was ribbed and strong, resembling the typical *Bucculatrix* cocoon rather than the delicate, white fusiform cocoon spun by larvae of *Leucoptera*.

A study of the literature revealed that there is a group of species in North America with their larvae living in stem galls or simply stems of Compositae (Braun, 1963). So stem/gall feeding in *Bucculatrix* does exist. Also, examination of the larvae showed that setae L1 and L2 on abdominal segments 1–8 were well separated, unlike the situation in Cemiostominae. Although scales are frequently appressed to the head in Cemiostominae, this is by no means always the case. An expanded scape is perhaps more visible in the Cemiostominae, but it occurs also in *Bucculatrix*. Even the glossy white of the wings is not universal in Cemiostominae. The apparent similarities between *ingens* and Cemiostominae are not demonstrably shared specializations.

The suggestion that *ingens* should be assigned to *Bucculatrix* rather than Cemiostominae was the presence of its ribbed cocoon and of a pupa with appendages free from, not fused to, the body. In the Cemiostominae, the appendages of the pupa are firmly fixed to the body. This latter pupal condition is almost certainly the specialized state, so while its absence in *ingens* does not indicate a relationship with *Bucculatrix*, it is a reason for excluding the species from Cemiostominae.

The discovery of *ingens* adds another dimension to the genus *Bucculatrix*, for it now includes a species of moth with glossy white wings and prominent 'eye-caps'. An important point to note is that without a study of the immature stages, *ingens* would probably have been assigned to the Cemiostominae.

Differences obviously exist between most species of *Bucculatrix* and *ingens*. For this reason, a new subgenus was created for *ingens*. The South African species was deliberately kept within *Bucculatrix* to emphasize the similarities rather than the differences.

The phylogenetic distinction between Lyonetiidae and Bucculatricidae is, it would appear, far greater than expected for it was argued by Kyrki (1984) that the groups actually belong to separate superfamilies.

Butterflies

What talk on Lepidoptera could possibly fail to mention the butterflies—the honorary birds of the insect world. Fortunately I have an illustration in connection with butterfly taxonomy for my third example. The eminent Japanese lepidopterist Professor Hiroshi Inoue was once asked by the late Emperor of Japan, who was greatly interested in natural history, a question that probably everyone in this room has been confronted with at one time or another. That is: what is the difference between butterflies and moths? Professor Inoue answered that the difference exists only in our minds.

Among the Geometridae (the moths with 'looper' caterpillars), in the subfamily Oenochrominae, were placed a series of rather delicate-winged, slender-bodied species from tropical America (Plate V, Figs 2–4) (Scoble, 1986; Scoble & Aiello, 1990). The oldest available generic name was *Macrosoma*. At first glance, these insects do indeed look like Geometridae. However, they lack abdominal tympanal

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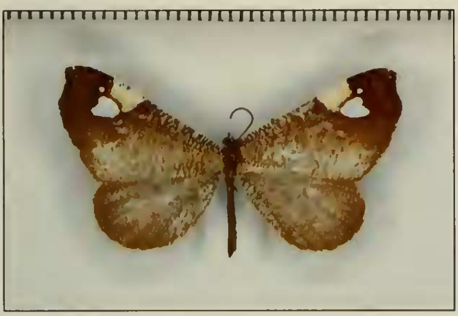
Plate V. 1, *Bucculatrix (Leucoedemia) ingens* Scoble & Scholtz (Bucculatricidae); 2–4, *Macrosoma* species (Hedylidae)—2, *M. semiermis* (Prout); 3, *M. subornata* (Warren); 4, *M. lucivittata* (Walker); 5–6, *Hypsidia* (Drepanidae)—5, *H. erythropsalis* Rothschild; 6, *H. niphosema* (Lower). (1,5,6 prepared by Phil Hurst of The Natural History Museum Photographic Unit.)

1. *Bucculatrix (Leucoedemia) ingens*

2. *Macrosoma semiermis*



3. *Macrosoma subornata*

4. *Macrosoma lucivittata*

5. *Hypsidia erythropsalis*

6. *Hypsidia niphosema*

organs. Apart from females of wingless or wing-reduced Geometridae, all geometrids have tympanal hearing organs located at the base of the abdomen. Although just a small proportion of lepidopteran *families* have tympanal organs (although not always located in the base of the abdomen), those families that do have these structures include those with very high numbers of species—Pyralidae, Geometridae, Noctuidae (and all the other noctuoid families). This means that most *species* of Lepidoptera do have tympanal organs.

The structure of lepidopteran tympanal organs varies in structure and position. In the Geometridae their anatomy is unique. In particular, there is a sclerite that curves over the tympanum and it is from this sclerite that the receptor is attached to the tympanic membrane. This sclerite is called the ansa, or tympanic handle. *Macrosoma* and its relatives lack any sign of an abdominal tympanal organ. Nor were some other features of *Macrosoma* adults typical of Geometridae. The wing venation is unlike that in Geometridae: the veins in the forewing are not fused in *Macrosoma*, but appear more simple than in Geometridae. Another peculiarity was the reduction (by fusion) in the number of the tarsomeres in the foreleg of males from five to two. The overall length of the foretarsi is not reduced—in fact the forelegs are sometimes very long. In addition, the pretarsus is reduced. A further character not shared by *Macrosoma* and Geometridae is the pouched condition in *Macrosoma* of the first abdominal tergum.

While examining the accessions, I came across a specimen with pupal exuviae attached to the pin. This remarkable specimen showed the presence of a silken girdle across the base of the abdomen (the first abdominal segment). It was after examining adult material, and the pupal shell just mentioned, that a last instar larva was received from Mr Roy Kendall, who had collected specimens feeding on *Byttneria aculiata* (Steruliaceae) in Mexico (Kendall, 1976).

A prominent feature in the larva of all of the few species of *Macrosoma* for which material is available, is the presence of a full set of prolegs. In Geometridae, typically, the larval prolegs are reduced in number to a pair on abdominal segment 6 and a pair on segment 10. In *Macrosoma*, as in macrolepidopterans generally, there is a pair on each of abdominal segments 3–6 and a pair on segment 10. In some geometers, additional prolegs are present in, for example, Archiearinae, some true Oenochrominae and some Ennominae. But usually these are reduced in number or in size. Prominent among the other features of the larva is the pair of cephalic processes ('horns') and the extension of the anal plate into a pair of furcae.

After receiving larval material, eggs of the same species were supplied by Dr Annette Aiello, from the Smithsonian Tropical Research Institute on Barro Colorado Island in Panama. These eggs resemble in general shape and, to a lesser extent, ribbing, those found in the butterfly family Pieridae and certain Nymphalidae. Since the study of these eggs, those of the type species of *Macrosoma* (*M. tipulata*) have been examined. Although not as elongated, they are of the same general shape and also are ribbed in the same way.

To which group of Lepidoptera is *Macrosoma* related? For the reasons discussed it is not a geometrid. Neither does it belong to any of the other families of macrolepidopterans with abdominal tympanal organs: Pyraloidea, Uraniidae, Drepanidae, Thyatiridae. The genus lacks thoracic tympanal organs, structures that delimit the Noctuoidea (e.g. Noctuidae, Lymantriidae, Arctiidae).

Although *Macrosoma* looks moth-like in general appearance (filiform or even bipectinate antennae; drab wings; typically with a frenulum/retinaculum wing-coupling apparatus; and collected mainly at night at light), some features are extremely similar to those found within butterflies. Some are fairly easily visible: the girdled pupa; the 'pouched' condition of the base of the abdomen in the adult insect; the downcurved state of the abdomen, particularly in males; the upright, fusiform egg; the fusion of most of the tarsomeres and the reduced pretarsus. Other features include: the close resemblance of the male genitalia to those of some Pieridae; the absence of fusion of the R veins in the forewing; the presence of small chambers, almost certainly tympanal organs, at the base of the forewing, and the appearance of the horned larva, which resembles those of apaturine nymphalid butterflies.

L. B. Prout noted the similarity of certain species of Hedylidae (what he called 'Hedylicae') with some butterflies. But he considered the butterfly-like characters as convergent and never really questioned that these Lepidoptera belonged to the Geometridae.

The problem with accepting many of these butterfly-like characters as evidence for a close relationship between *Macrosoma* and butterflies, is that some of them occur only in particular subgroups of butterflies. There is no acceptable reason to assume that some of the characters in question (e.g. the alar tympanal organs, horned condition of the larva, reduced forelegs) are shared by *Macrosoma* and the most primitive butterflies. We simply do not know if there existed an ancestor of *Macrosoma* and the butterflies that shared these characters. There is, however, one character that possibly is shared uniquely between *Macrosoma* and the butterflies in general. This is the pouching of the first abdominal tergum. A girdled pupa is a feature shared by *Macrosoma* and true butterflies, but not skipper butterflies.

The first suggestion of the butterfly affinity of *Macrosoma* made in 1986 (Scoble, 1986) resulted in considerable interest. The eggs of *Macrosoma* were studied later (Scoble & Aiello, 1990). Recently, two papers dealing with, amongst other issues, the relationship between *Macrosoma* and butterflies have been written. One of these involved the cladistic analysis of a large dataset of morphological characters (de Jong *et al.*, 1996). The other (Weller & Pashley, 1995), although making use of morphological characters, has been innovative by applying molecular techniques in the search for butterfly origins.

The methods of both studies will doubtless be examined critically. But the results of the studies, with regard to the relationships of *Macrosoma*, leave us little closer to determining the exact relationship of *Macrosoma* to the butterflies. The study using morphological data suggested that *Macrosoma* and *Urania* (Uraniidae) vie for being the closest relatives of the butterflies. The study involving a combination of morphological and molecular data lent added support to the close association of *Macrosoma* with Hesperioidea and Papilionoidea.

One message I gain from this interesting episode, as it relates to natural history, is that often high levels of taxonomic resolution can be achieved with a good collection, a microscope and carefully planned fieldwork. My impression is that substantially greater resolution is by no means certain in analyses with large morphological datasets or with molecular data. This comment should not be taken as a general attack on these procedures, for they are useful in refining classifications or providing confirmation. Rather, my aim is to emphasize the value of what can be achieved using well tried techniques.

Drepanidae

The final example involves three superfamilies: Pyraloidea, Noctuoidea and Drepanoidea but just six species of moths. All the species are from Australia, but, again, all three superfamilies are represented in Britain.